Claims

1. A voltage variation generator for generating load voltage of voltage sag, voltage swell and instant outage for performance test of custom power devices, the voltage variation generator comprising:

a supply voltage unit for applying AC supply voltage V_s, a positive output terminal of the supply voltage unit being connected in series to a load;

a variable voltage adjuster connected to the positive output terminal of the supply voltage unit, for obtaining first voltage from the supply voltage according to a first transformation ratio;

a variable voltage-side switch including two switching devices connected in reverse-parallel to each other, for selectively contacting in series with a primary side coil (interval Ⅰ) or a secondary side coil (interval Ⅱ) of the variable voltage adjuster and adjusting a contact point position with the variable voltage adjuster;

a transformer-side switch including two switching devices connected in series to the variable voltage-side switch, said two switching devices being connected in parallel to each other in a reverse direction; and

a transformer including a primary side and a secondary side, for obtaining second voltage from the first voltage according to a second transformation ratio, the primary side

being connected in parallel to the transformer-side switch, the secondary side being connected in series to a negative output terminal of the supply voltage unit and the load respectively.

2. The voltage variation generator as claimed in claim 1, wherein the switching device includes a SCR (Silicon Controlled Rectifier) thyristor.

3. The voltage variation generator as claimed in claim 1, wherein the switching device includes at least one of an Insulated Gate Bipolar Transistor (IGBT) and an Insulated Gate Command Thyristor (IGCT).

4. The voltage variation generator as claimed in claim 1, wherein the variable voltage adjuster is an autotransformer and includes a slidacs.

5. The voltage variation generator as claimed in claim 1, wherein, when voltage across the load is in a normal state, the variable voltage-side switch is turned off, the transformer-side switch is turned on, and the voltage across the load is the same as the supply voltage V_s.

6. The voltage variation generator as claimed in claim

1, wherein, when voltage of the load is in a voltage sag state, the variable voltage-side switch is turned on, the transformer-side switch is turned off, the contact point position is located in an upper portion of the secondary side coil, and the voltage across the load is $V_s(1-1/n\cdot nT)$.

7. The voltage variation generator as claimed in claim 1, wherein, when voltage across the load is in a voltage swell state, the variable voltage-side switch is turned on, the transformer-side switch is turned off, the contact point position is located in the primary side coil, and the voltage across the load is $V_s(1+1/n\cdot nT)$.

8. The voltage variation generator as claimed in claim 6 or 7, wherein degree of the voltage sag or voltage swell is adjusted by controlling the first transformation ratio value.

9. The voltage variation generator as claimed in claim 8, wherein the first transformation ratio value is adjusted according to movement of the contact point position while the voltage sag state or the voltage swell state is maintained.

10. The voltage variation generator as claimed in claim 1, wherein, when voltage across the load is in an

instant outage state, the variable voltage-side switch is turned on, the transformer-side switch is turned off, the contact point position is located in a lower portion of the secondary side coil.

11. The voltage variation generator as claimed in claim 1, wherein the voltage variation generator is a single phase generator, a 3-phase generator, or a generator having more than 3 phases, wherein the 3-phase generator has at least two contact point positions different from each other, thereby generating a voltage unbalance state.

12. The voltage variation generator as claimed in claim 1 or 11, wherein, when voltage of the load is in a voltage unbalance state, the variable voltage-side switch is turned on, the transformer-side switch is turned off, the contact point position is located in an upper portion of the secondary side coil.

13. The voltage variation generator as claimed in claim 1, wherein the load includes at least one of a Dynamic Uninterruptible Power Supply (UPS), a Dynamic Voltage Restorer (DVR), a Distribution Static Compensators (DSTATCOM), a Static Var Compensators (SVC), and a Solid State Transfer Switches (SSTS).